

Appl. No. 10/698,988  
Amdt. Dated October 26, 2005

Attorney Docket No.: NSL-014  
Reply to Advisory Office Action of September 28, 2005

**REMARKS:****REQUEST FOR CONTINUED EXAMINATION**

Pursuant to 37 CR. 1.114, the Applicants are submitting herewith a Request for Continued Examination of the present application along with the appropriate fee. Out of an abundance of caution, the Applicants are re-submitting the amendments filed on September 26, 2005, entry of which is respectfully requested.

**AMENDMENTS TO THE CLAIMS**

To expedite prosecution, the Applicants have canceled claims 1-11 without prejudice. The Applicants reserve the right to pursue of the subject matter of these claims in a later-filed recite divisional application. New claim 28 has been added to recite that adjacent layers of the organic polymer material and inorganic material are covalently bonded to each other at an interface between organic and inorganic materials. The Applicants submit that support for this feature can be found in the specification at page 7, lines 1-3 and as set forth below. New claim 29 has been added to recite that the layers of organic and inorganic material are discrete. The Applicants submit that support for this feature is shown in FIG. 1 as originally filed. New claim 30 has been added to recite that the alternating organic and inorganic layers form a tortuous path. Support for this feature can be found in the specification as filed at page 3, lines 23-30. As such, no new matter has been added with these amendments. The Applicant submits that entry of these amendments is proper since a Request for Continued Examination and appropriate fees are filed concurrently herewith.

**SPECIFICATION OBJECTIONS**

In the Advisory Office Action of September 28, 2005, the Examiner has not repeated the objection to a previous amendment to the specification under 35 USC 132(a) for introducing new matter. In the response submitted on September 26, 2005, the Applicants submitted arguments that no new matter had been entered. Furthermore, the Applicants stated in the September 26 response that the Examiner had agreed with these arguments in the interview of September 20, 2005. The Applicants respectfully request withdrawal of the objection and entry of the amendment if this has not already been done.

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## CLAIM REJECTIONS

### 35 USC 112

The Advisory Action of September 28, 2005 does not mention the status of the prior rejections of Claims 25-26 under 35 USC 112, first paragraph for failing to comply with the written description requirement. The Applicants respectfully traversed these rejections in the Office Action response of September 26, 2005. The Applicants argued that the subject matter of claims 25 and 26 had been properly incorporated by reference into the specification and was present in the specification as of its filing date. In addition, in the interview with attorney of record Joshua D. Isenberg and inventor Brian M. Sager on September 20, 2005, the Examiner indicated that these arguments would overcome the both new matter objections to the specification and the above claim rejections under 35 USC 112. Clarification of the status of these rejections is respectfully requested.

### 35 USC 102

Claims 12-14, 20-21, 23-25 and 27 were rejected under 35 USC 102(b) as being anticipated by US Patent 6,472,467 B1 to Chiao (hereinafter Chiao). In upholding these rejections the Examiner has asserted that each layer disclosed by Chiao is both an organic material and an inorganic material and covalent bonding therefore occurs between inorganic and organic layers.

The Applicant submits that the Examiner's interpretation of claim 12 as reading on any layers that contain both organic and inorganic material is inconsistent with the language of the claim as it presently stands. Claim 12 recites covalent bonding between a layer of organic polymer material and an adjacent layer of inorganic material. The Applicants submits that it is clear from the language of claim 12 that even if, arguendo, the layers include both organic and inorganic materials, the bonding occurs between organic and inorganic *materials*. The Applicants further submit that this interpretation of claim 12 is consistent with the specification as originally filed.

Specifically, page 7, lines 1 to 3 which state "The resulting nanocomposite structure in the multi-layer film is stabilized by (a) organic polymerization, (b) inorganic polymerization, and (c) covalent bonding at the organic interfacial surfaces." (Emphasis added). The Applicants submit that it is clear from Brinker, which has been incorporated into the present application by reference that the covalent bonding occurs at interfaces between organic and inorganic materials (see Brinker col. 5, lines 30-35).

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The Applicant submits that in view of the foregoing discussion, the composition Chiao describes is not a nanolaminate formed of layers of organic and inorganic material covalently bonded to each other as set forth in claim 12.

Furthermore, in making the assertion that covalent bonding occurs between organic and inorganic layers, the Examiner has pointed to no specific teaching or suggestion in Chiao that any covalent bonding occurs between an organic material and an inorganic material as set forth in claim 12. Instead the Examiner's rejection appears to be based on two premises: 1) that each layer of Chiao is both an organic layer (or material) and an inorganic layer (or material); and 2) that adjacent layers are covalently bonded to each other. Chiao describes solutions and coatings containing two inorganic components and a third component which contains a cross-linkable organic functionality (see col. 2, lines 60-64). Chiao goes on to describe the two inorganic components as being inorganic particles and inorganic surface modifiers that coat the inorganic particles. In his discussion of forming the coating, Chiao discusses removing a solvent and then applying a stimulus to cause any cross-linkable moieties in the cross-linker to cross-link or polymerize (see col. 7, lines 1-4). Utterly absent from Chiao is any teaching or suggestion that the cross-linkable organic component in some way covalently bonds with either of the inorganic components.

The Examiner is reminded that 37 CFR 104(c)(2) states in pertinent part:

When a reference is complex or shows or describes inventions other than that claimed by the applicant, the particular part relied on must be designated as nearly as practicable. The pertinence of each reference, if not apparent, must be clearly explained and each rejected claim

The Applicants submit that the in view of the foregoing discussion, the Chiao reference is complex and describes inventions other than those claimed by the Applicants. The Applicants respectfully request that the Examiner point out the particular part relied on to show that Chiao teaches covalent bonding of an organic material to an inorganic material.

In the absence of a citation of any teaching or suggestion that the cross-linkable organic component in some way covalently bonds with either of the inorganic components, the Applicant can only conclude that the Examiner is either a) relying on facts within the Examiner's personal knowledge or b) relying on a theory of inherency to support his contention that Chiao teaches covalent bonding between organic and inorganic materials.

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If the Examiner is relying on facts within the Examiner's personal knowledge, 37 CFR 1.104(d)(2) applies as follows:

5 2) When a rejection in an application is based on facts within the personal knowledge of an employee of the Office, the data shall be as specific as possible, and the reference must be supported, when called for by the applicant, by the affidavit of such employee, and such affidavit shall be subject to contradiction or explanation by the affidavits of the applicant and other persons.

10 Therefore, if the Examiner is relying on facts within his personal knowledge, the Applicants respectfully request that the Examiner provide an affidavit setting forth such facts as are relevant to the rejections of the claims in the present Application.

If the Examiner is relying on inherency, the examiner must provide rationale or evidence tending to show inherency. MPEP 2112 states that “[t]he fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic... The mere fact that a certain thing may result from a given set of circumstances is not sufficient.” *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999).

15 The Applicant submits that the Examiner has presented no rationale tending to show the inherency of covalent bonding between organic and inorganic materials when nanoparticulate inorganics are mixed with an organic component that is then cross-linked. In the absence of any such rationale, the Examiner cannot rely on inherency to support a rejection under 35 USC 102.

20 Further, with the respect to the term nanolaminate, which appears in the claims, the Applicants submit herewith an abstract entitled ‘Fabrication and Properties of Nanolaminates’, as evidence of the well understood meaning of the term. The Examiner’s attention is respectfully drawn to the photograph illustrating a nanolaminate. Note that the layers are stacked and are of substantially uniform thickness as is shown in FIG. 1 of the present application (drawing B). In addition, the Applicants submit the following abstract of “*Microstructural evolution of ZrO<sub>2</sub>-HfO<sub>2</sub> Nanolaminate Structures Grown by Atomic Layer Deposition*” by H. S. Kim, P. C. McIntyre, and K. C. Saraswat, from the Journal of Materials Research, vol. 19, no. 2, February 2004 , pp 643 -650, which illustrates use of the term nanolaminate.

25 30 35 **Abstract:** Zirconia-hafnia (ZrO<sub>2</sub>-HfO<sub>2</sub>) nanolaminate structures were grown using the atomic layer deposition (ALD) technique with different stacking sequences and layer thickness layer thicknesses. The microstructural evolution and surface roughness were compared with those of single-layer ZrO<sub>2</sub> or HfO<sub>2</sub> films using transmission electron microscopy and atomic force microscopy. Thin single-layer ALD-ZrO<sub>2</sub> films were polycrystalline and composed of the tetragonal ZrO<sub>2</sub> phase as-deposited, whereas thicker (>14 nm) films were composed mainly of the monoclinic phase. HfO<sub>2</sub> films were amorphous as-deposited and crystallized into primarily monoclinic during subsequent anneals at temperatures over 500 °C. All the nanolaminate structures having individual layer thicknesses greater than approximately 2 nm were

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crystalline (mixture of tetragonal and monoclinic phases) independent of layer sequence and also exhibited a layer-to-layer epitaxy relationship within each grain. However, the identity of the starting layer determined the final grain size and surface roughness of the nanolaminates. A qualitative model for the observed microstructure evolution of the laminate films is proposed. [Emphasis added]

5 Note that this abstract identifies nanolaminates as being made of stacked layers and having thicknesses of a few nanometers. The Applicants submit that these references make it clear that the term "nanolaminate" refers to structures made of multiple stacked layers of nanometer scale or sub-nanometer scale.

With respect to drawing A, which Applicant submitted in the response of September 26, 2005, it  
10 is submitted that Chiao, unfortunately, includes no drawings at all. The Applicant submitted the drawing to illustrate the distinction between Chiao and the present claims. The Applicant submits that this drawing is based on Chiao's description of the coatings as being formed of a solution containing inorganic nanoparticulates that are mixed (see e.g., col. 4, lines 33-36). Although, as the Examiner points out, Chiao does teach multilayer sequential coatings (see e.g.,  
15 col. 6, lines 26-31) it is the Applicants' contention that these multilayer coatings are simply the result of multiple applications of coatings of the type Chiao describes, i.e., multiple layers of the type the Applicants have attempted to illustrate with drawing "A" of the previous amendment.

The Applicants submit that a side-by-side comparison of drawing A and drawing B illustrates why Chiao does not teach all the features of claim 12. Drawing B (a portion of FIG. 1 of the  
20 present application as filed) illustrates a nanolaminate "wherein the layers of organic polymer material alternate with the layers of inorganic material" and "wherein adjacent layers of the organic polymer material and inorganic material are covalently bonded to each other" as set forth in claim 12. It is the Applicants' contention that Chiao's multiple layers are not differentiated into discrete layers of organic polymer material alternating with discrete layers of inorganic  
25 material as shown in FIG. 1 (drawing B) and as set forth in claim 12. Instead, Chiao's nanoparticulates are randomly mixed among the organic cross-linker as Chiao describes and as illustrated in Applicants' drawing "A". It is the Applicants' contention, therefore, that claim 12 reads on FIG. 1, but does not read on Chiao since Chiao's organic and inorganic materials are neither differentiated into alternating layers of organic and inorganic materials nor are adjacent  
30 organic and inorganic materials described as covalently bonded to each other in Chiao. The Examiner has not argued that Chiao teaches or suggests anything like what is shown in FIG. 1.

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Therefore, the Applicants conclude that Chiao does not teach or suggest all the features of claim 12.

Therefore, for all the reasons set forth above, the Applicants submit that Chiao does not teach or suggest an inorganic/organic hybrid nanolaminate barrier film having all the features set forth in 5 claim 12 and the article of manufacture set forth in claim 23. As such, a prima facie case of anticipation is not present and claim 12 defines an invention suitable for patent protection. In addition, claims 13-14, 20-21 and 27 depend either directly or indirectly from claim 12 and recite additional features therefore. Similarly claims 24-25 depend from claim 23 and recite additional features therefore. As such, and for the same reasons set forth above, the Applicants submit that 10 Chiao does not anticipate these dependent claims, which define an invention suitable for patent protection.

### 35 USC 103

Claims 16-17 were rejected under 35 USC 103(a) as being obvious over Chiao in view of WO 00/78540 to Singh et al (hereinafter Singh). In addition, claim 15 was rejected as being obvious 15 over Chiao in further view of US Patent 6,818,163 to Fibiger et al. (hereinafter Fibiger). Also, claims 18-19 were rejected as being obvious over Chiao in view of US Patent 5,372,888 to Ogawa (hereinafter Ogawa). Furthermore, claims 22 and 26 were rejected as being obvious over Chiao in further view of US Patent 6,264,741 to Brinker et al. (hereinafter Brinker). The applicants respectfully traverse the rejections.

20 For the reasons set forth above, the applicants submit that Chiao does not teach all the features of claim 12. The Examiner has pointed to no teaching in Fibiger, Ogawa or Brinker, either alone or in combination with Chiao tending to teach or suggest all the features of claim 12. As such, no combination of Singh with Fibiger, Ogawa, Brinker or skill in the art teaches or suggests all the features of claim 12 and a prima facie case of obviousness is not present. Furthermore claims 25 15-19, 22 and 26 all depend from claim 12 and recite additional features therefor. As such, and for the same reasons set forth above the applicants submit that these dependent claims define an invention suitable for patent protection.

### NEW CLAIM 28

The Applicants submit that new claims 28, 29, and 30 depend directly from claim 12 and are 30 allowable over the prior art and is allowable for the reasons set forth above. In addition, with

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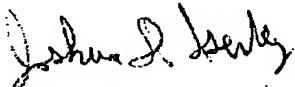
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respect to claim 28, the Applicant submits that Chiao does not teach or suggest covalent bonding between an organic polymer material and an inorganic material at an interface between them as set forth in claim 28. In addition, Chiao's intermixed organic and inorganic materials do not form covalently bonded discrete layers as set forth in claim 29. Furthermore, Chiao does not teach or suggest that the layers present a tortuous path through a barrier film to an underlying substrate as set forth in claim 30. As such, and for at least this additional reason, the Applicants submit that claims 28, 29 and 30 define an invention suitable for patent protection.

### CONCLUSION

10 For the reasons set forth above, the Applicants submit that all claims are allowable over the cited art and define an invention suitable for patent protection. The Applicants therefore respectfully request that the Examiner enter the amendment, reconsider the application, and issue a Notice of Allowance in the next Office Action.

Respectfully submitted,

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